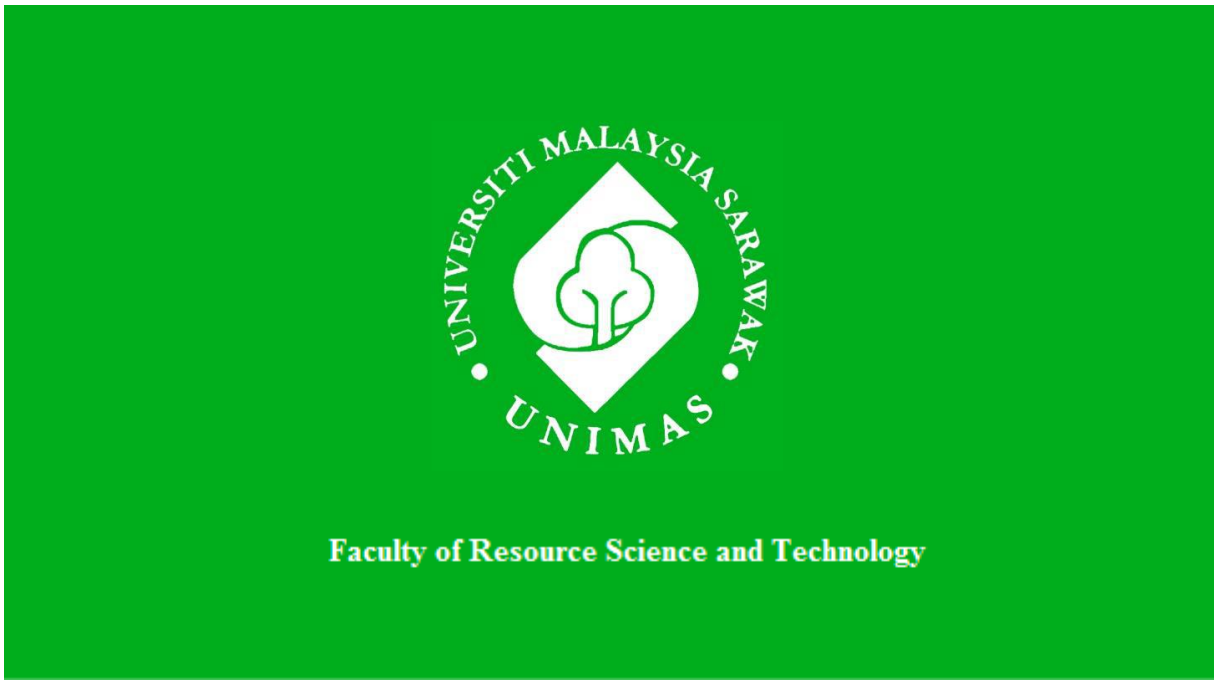

PROPAGATION AND ESTABLISHMENT OF *Cassytha filiformis* L.

CHER CAMMILLY ANAK ALENG

Bachelor of Science with Honours
(Plant Resource Science and Management)
2015

UNIVERSITI MALAYSIA SARAWAK

Grade: _____

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Final Year Project Report ☑

Masters ☐

PhD ☐

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PROPAGATION AND ESTABLISHMENT OF *Cassytha filiformis* L.

CHER CAMMILLY ANAK ALENG

(35714)

A dissertation submitted in partial fulfillment of the requirement for The Degree of Bachelor of Science with Honours

Plant Resource Science and Management

Faculty of Resource Science and Technology
UNIVERSITI MALAYSIA SARAWAK

2015

APPROVAL SHEET

Name of Candidate : Cher Cammilly Anak Aleng

Title of Dissertation : Propagation and Establishment of *Cassytha filiformis* L.

_____

(Prof. Dr. Isa Ipor)

Supervisor

_____

(Dr. Rebicca Edward)

Coordinator

Plant Resource Science and Management Programme

Department of Plant Science and Environmental Ecology

Faculty of Resource Science and Technology

University Malaysia Sarawak

DECLARATION

I declare that no portion of the work referred to in this dissertation has been submitted in support of an application for another degree of qualification of this or any other university or institution of higher learning.

_____

(CHER CAMMILLY ANAK ALENG)

Programme of Plant Resource Science and Management

Department of Plant Science and Environmental Ecology

Faculty of Resource Science and Technology

University Malaysia Sarawak

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LIST OF ABBREVIATIONS

STDEV - Standard Deviation

SE – Standard Error

MPOB – Malaysian Palm Oil Board

MPOC – Malaysian Palm Oil Council

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Propagation and Establishment of *Cassytha filformis* L.

Cher Cammilly Anak Aleng

Plant Resource Science and Management
Faculty of Resource Science and Technology
University Malaysia Sarawak

ABSTRACT

Cassytha filiformis L. has a potential as a cover crop in oil palm plantation. This study aims to determine the effective method of vegetative propagation for the establishment of *Cassytha filiformis* and to determine the effect of different placements and different weights for the establishment of *Cassytha filiformis*. There are three methods that have been done throughout the experiment. They were different placements of *Cassytha filiformis* on the host plant (*Mikania micrantha*), two different initial weights (20 g and 50 g) of *Cassytha filiformis* placed within the shoot of the host plant (*Mikania micrantha* H. B. K.) and propagation of *Cassytha filiformis* through cutting method using *Asystasia* sp. as the host plant. The results show that the *Cassytha filiformis* established well when it was placed within the host plant with a higher mean of fresh biomass and growth distribution area. *Cassytha filiformis* was also established well when the initial weight for propagation was 50 g with a higher mean of fresh biomass and growth distribution area. Lastly, different cutting methods for propagation showed that *Cassytha filiformis* can be propagated well by wrapping it around of the host plant with a 72.5 % of success. In the end of this experiment, we concluded that *Cassytha filiformis* can be propagated by using its stem and it is established well in their new introduced place.

Keywords:*Cassytha filiformis*, *cover* crop, parasitic plant

ABSTRAK

Cassytha filiformis L. mempunyai potensi sebagai tanaman penutup bumi di kawasan pertanian seperti ladang kelapa sawit. Kajian ini bertujuan untuk menentukan kaedah pembiakan vegetatif yang berkesan bagi penumbuhan *Cassytha filiformis* dan untuk menentukan kesan kedudukan yang berbeza dan berat yang berbeza bagi penumbuhan *Cassytha filiformis*. Kaedah-kaedah yang digunakan adalah *Cassytha* filiformis akan diletakkan di kedudukan yang berbeza pada tumbuhan perumah (*Mikania micrantha* H. B. K.), dua berat yang berbeza (20 g dan 50 g) *Cassytha filiformis* menggunakan tumbuhan perumah (*Mikania micrantha*) dan pembiakan menggunakan batang *Cassytha filiformis* pada tumbuhan perumah (*Asystasia* sp.). Hasil kajian menunjukkan bahawa penumbuhan *Cassytha filiformis* lebih baik apabila ia diletakkan di kedudukan bawah tumbuhan perumah dengan purata jisim dan keluasan sebaran yang tinggi. Penumbuhan *Cassytha filiformis* juga lebih baik apabila ia ditanam dengan jisim awal sebanyak 50 g menghasilkan purata jisim selepas tuai dan keluasan sebaran yang tinggi. Akhir sekali adalah kaedah keratin batang. Kajian menunjukkan kaedan lilitan pada tumbuhan perumah adalah lebih Berjaya berbanding dengan hanya mengikat di tepi tumbuhan perumah dengan peratusan 72.5 %. Di akhir kajian ini, kesimpulan telah dibuat bahawa *Cassytha filiformis* boleh ditanam menggunakan pembiakan vegetatifnya dan tumbuh dengan baik di tempat baru.

Kata kunci: *Cassytha filiformis*, parasit, tanaman penutup bumi

1.0 INTRODUCTION

Malaysia is one of the biggest producers and exporters of oil palm and oil palm products which make Malaysia have an important role to play in fulfilling the global need for oils and fats sustainably (MPOC, nd). According to MPOC (nd) approximately 4.49 million hectares of land in Malaysia is under oil palm cultivation. MPOB (nd) stated that in 2011, the total planted area was 4.917 million hectares. This shows that palm oil has become the most important crop in Malaysia. The Malaysian oil palm industry can easily meets the local oils and fats demand and the excess kernel oil produced will be exported (MPOB, nd).

As the palm oil plantation getting more important in Malaysia, weeds have become a major problem in the palm oil plantation area. Essandoh et al. (2011) stated that weeds such as *Mikania micrantha, Mikania cordata, Chromolaena odorata, Imperata cylindrical* and *Asystasia* sp. compete with the oil palm for nutrients, moisture and sunlight which can cause yield depression. Sustainable weed management in oil palm plantation has been a challenge now a day (Samedani et al., 2014). According to Ishak et al. (2011), there is possible way to control the weeds problem but the required labor for manual weeding is costly and hardly available and the agricultural workers who performing manual weeding are exposed to high risk of musculoskeletal disorders to the lower back.

Cultivation of cover crops qualifies as part of a sustainable agricultural practice (Samedani et al., 2014). Leguminous cover crops are used to co-exist with the oil palm following jungle clearing and planting or replanting, to provide complete cover to an otherwise bare soil to protect the soil from the forces of erosion. The leguminous cover crops also have multiple functions such as reducing soil water evaporation, runoff losses, soil erosion, improve or maintain soil fertility and recycling of nutrients. The commonly

used leguminous cover crops species in Malaysia are *Pueraria phaseloides* (synonym for *Pueraria javanica*), *Centrosema pubescens*, *Calopogonium mucunoides*, *C. Caeruleum* and *Mucuna bracteata* (Samedani et al., 2014). However, seeds of the cover crop can be expensive and it may not germinate due to inappropriate pre-sowing treatment caused by human error. To overcome this problem, parasitic plant is suggested used as an alternative cover crop.

Study has been done on identifying the propagation and establishment of a parasitic plant specifically *Cassytha filiformis.* This plant depends on its host plant in order to survive. The host plant plays important roles to provide enough water, food and mineral for the parasitic plant to survive. The *Cassytha filiformis* usually attack woody host such as citrus, mango (*Mangifera indica*), cloves (*Eugenia aromatic*), nutmeg (*Myristica fragrans*) and avocado (*Persea Americana*) (Nelson, 2008). In this research, *Cassytha filiformis* were propagate using the vegetative part which is stem and establishment was observed.

1.1 Problem Statements

Cultivation of cover crops is one of a sustainable agricultural practice in crop plantation (Samedani et al., 2014). However, seeds of the cover crop can be expensive and it may not germinate due to inappropriate pre-sowing treatment caused by human error. In order to overcome this problem, we suggest using the parasitic plant as an alternative cover crop. *Cassytha filiformis* is a parasitic plant which can be used as a cover crop plant. *Cassytha filiformis* also has a lot of benefit to human being. *Cassytha filiformis* is commonly propagated by using seeds. Therefore, for this study, we propagated the *Cassytha filiformis* by using its stem.

1.2 Objectives

1. To determine the effective method of vegetative propagation for the establishment of *Cassytha filiformis*.

2. To determine the effect of different placement and different weights for the establishment of *Cassytha filiformis*.

2.0 LITERATURE REVIEW

2.1 Botanical descriptions of *Cassytha filiformis* L.

Cassytha filiformis L. is a leafless, climbing, twining, vine-like, autoparasitic and plant hyperparasitic phanerogam (seed-bearing plant) in the plant family Lauraceae. According to Mythili et al. (2011) *Cassytha filiformis* is a leafless and perennial vine with small scales as a replacement of the leaves and adheres to the host by the haustoria that penetrates the epidermis of the other plants, and hence helps to spread through the tops of the trees and bushes, thus ultimately forming a long festoons of colourful greenish yellow vines. The individual stems that are copiously branched have a range of 1 to 3 millimeters in the diameter and finally attain a maximum length of 10 to 20 feet. The flowers were produced all over the year with a bisexual nature with a stamen and perianth arrangement that looks similar to the ordinary avocado. The ovary is the one first getting exposed and later on becomes enveloped by the enlargement and then the over growth of the calyx tube occurs. The fruit is about the size of the large pea and gets closely enclosed by means of the succulent calyx.

2.2 Importance of *Cassytha filiformis*

The *Cassytha filiformis* has an active components in which can be used for medicinal purposes. Mythili et al. (2011) stated that *Cassytha filiformis* has been reported as a beneficial medicine against the gonorrhea, kidney ailments and as the diuretic. In Africa it was used to treat the cancer and African trypanosomiasis. Nelson (2008) also had mention that *Cassytha* filiformis is widely used for its medicinal purposes such as in the Pasific region. They use the plant to treat the jellyfish stings in Fiji. The Hawaiians used this parasitic plant as a ceremonial human ornament and also in the decorative garlands and in the lei. The brown color of the stem is used as the coloring agent (neutral dye) as it provided brown color for a fabric (Mythili, 2011). *Cassytha filiformis* is also a source of food for human and animal. It is also can be a potential biological control agent for invasive plant since it is a parasitic plant (Nelson, 2008). On the other hand, it is also a pestiferous and pathogenic weed which is a major threat to the agriculture and other endangered plants as they are capable of transmitting the pathogens between the plants (Mytthili et al., 2011).

Cassytha filiformis is a parasitic plant (Nelson, 2008). This means this plant is harmful to its host plant. A disease of the host plant is caused by the effect of infection of host plants by its haustoria which are found on the stem. The Haustoria will penetrate the host epidermis and extend into more interior tissue, extracting cellular nutrients and water from plant phloem and xylem. This will make the *Cassytha filiformis* absorb nutrients and water from the host plant. These activities do not create immediate, fatal damage to the host plant.

2.3 Parasitic Plant

Parasite is from a Greek. Para means beside and sitos means grain or food which literally means “beside the food”. The lifecycle of parasitic plant species is closely regulated by the presence of their host plant and signaling molecules released by the host plant play an important role in this interaction (Bouwmeester, 2013). Parasitic plant may cause damage to their host plant which may be one of the demand economic plants.

Most of plant can produce their own food because it contains chlorophyll but it is different for the parasitic plant. The parasitic plant does not has a chlorophyll which cause it cannot produce its own food and depending 100% to its host plant for the food source.

Daniel L. et al. (2010) define a parasitic plant as an angiosperm that directly attaches to another plant via haustorium. Haustorium is a modified root that forms a morphological and physiological link between the parasite and its host plant. A parasitic plant obtains a mature, functioning root system when their seedling forms a haustorium. For the root parasitism, it prefers an open, sunny area. These areas are usually containing dense groundcover vegetation which a great amount of host plant for the parasite plant.

2.4 Propagation of *Cassytha filiformis*

During winter, *Cassytha filiformis* seeds germinate and produce a slender yellowish shoot, but not root and when it is in contact with a susceptible host, the shoot will encircles the host plant, haustoria is form and it begins to climb up the plant (Mukhtar et al., 2010).

Seedlings of *Cassytha filiformis* can survive for up to two months without a host and growing to a length of 30 cm or more. Nelson (2008) stated that *Cassytha* species are parasitic vines with small haustoria. Haustoria is a modified atem which help the parasitic plant to absorb nutrients and water from the host plant. The haustoria of *Cassytha filiformis* penetrate the host epidermis and extend into more interior tissues, extracting cellular nutrients and water from plant phloem and xylem.

Nelson (2008) had also mention that two *Cuscuta* species of the family Convolvulaceae have a similar appearance to *Cassytha filiformis* and also have a similar mode of parasitism. Cuscuta sandwichiana is being propagated by using seeds same as *Cassytha filiformis* and it can also be grown by wrapping cuttings around host plants such as weeds or other unwanted plants (Hawaiian Native Plant Propagation Database: *Cuscuta* sandwichiana, 2002)

2.5 Plant Establishment

Plant establishment is defined as the process by which a plant becomes established in a new habitat. General environment can be a difficult one for establishing some native plants. Plants need a necessary time to adapt well to their new environment. The new environment may be much extreme growing conditions than their origin environment.

The plant can dry out easily because the root are not deep into the natural soil to consume water and nutrient, there is no sufficient plant mass to handle a bad attack by pest and it need to overcome ‘transplant shock’ where it may be damage particularly its root in planting process (Plant Establishment Methods, 2011). A new plant has a greater change of things going wrong than one that is well established. Plants will be considered established once they have rooted into the growing medium and produce new growth. Much care needed to be considered during the plant establishment period.

3.0 MATERIALS AND METHODS

3.1 Study Site

The *Cassytha filiformis* were taken from Unijaya, UNIMAS. The research was carried out at Tun Ahmad Zaidi College, UNIMAS and Kampung Giam, Padawan.

1(a)

1(b)

Plate 1. The study site of propagation of *Cassytha filiformis*. 1(a) source of *Cassytha filiformis*. 1(b) The study site.